WHAT IS CLAIMED IS:

1. A method for embedding digital watermark data in digital data contents, said method comprising the steps of:

receiving said digital data contents and said digital watermark data;

dividing said digital data contents into block data;

obtaining a frequency coefficient of said block data;

obtaining a complexity of said block data;

obtaining an amount of transformation of said frequency coefficient from said complexity and said digital watermark data by using a quantization width;

embedding said digital watermark data in said digital data contents by transforming said frequency coefficient by said amount; and

generating watermarked digital data contents.

2. The method as claimed in claim 1, said step of obtaining said complexity of said block data comprising the steps of:

transforming said block data, by applying a wavelet transform, into coefficients of said wavelet transform, and

obtaining said complexity on the basis of the number of high frequency coefficients in said coefficients of said wavelet transform, each of said

high frequency coefficients exceeding a threshold.

3. A method for embedding digital watermark data in digital data contents, said method comprising the steps of:

receiving said digital data contents and said digital watermark data;

dividing said digital data contents into block data;

obtaining a frequency coefficient of said block data;

obtaining an amount of transformation of said frequency coefficient from said digital watermark data by using a quantization width corresponding to said frequency coefficient, said quantization width being obtained beforehand according to a manipulation method of said digital data contents;

embedding said digital watermark data in said digital data contents by transforming said frequency coefficient by said amount; and

generating watermarked digital data contents.

4. The method as claimed in claim 3, wherein said quantization width is obtained by a method comprising the steps of:

dividing first digital data contents into one or a plurality of first block data;

dividing second digital data contents into one or a plurality of second block data, said second

digital data contents being obtained by manipulating said first digital data contents with a predetermined manipulation method;

transforming said first block data and said second block data into first frequency coefficients and second frequency coefficients respectively by applying an orthogonal transform;

obtaining difference values between said first frequency coefficients and said second frequency coefficients for each frequency coefficient;

calculating a standard deviation of distribution of said difference values; and

obtaining said quantization width by multiplying said standard deviation by a watermark embedding strength.

5. A method for reading digital watermark data embedded in digital data contents, said method comprising the steps of:

receiving said digital data contents;

dividing said digital data contents into block data;

obtaining a frequency coefficient of said block data; and

generating digital watermark data from said frequency coefficient by using a quantization width corresponding to said frequency coefficient, said quantization width being obtained beforehand according to a manipulation method of said digital data contents.

6. The method as claimed in claim 5, wherein said quantization width is obtained by a method comprising the steps of:

dividing first digital data contents into one or a plurality of first block data;

dividing second digital data contents into one or a plurality of second block data, said second digital data contents being obtained by manipulating said first digital data contents with a predetermined manipulation method;

transforming said first block data and said second block data into first frequency coefficients and second frequency coefficients respectively by applying an orthogonal transform;

obtaining difference values between said first frequency coefficients and said second frequency coefficients for each frequency coefficient;

calculating a standard deviation of distribution of said difference values; and

obtaining said quantization width by multiplying said standard deviation by a watermark embedding strength.

7. An apparatus for embedding digital watermark data in digital data contents, said apparatus comprising:

means for receiving said digital data contents and said digital watermark data;

means for dividing said digital data contents into block data;

means for obtaining a frequency coefficient of said block data;

means for obtaining a complexity of said block data;

means for obtaining an amount of transformation of said frequency coefficient from said complexity and said digital watermark data by using a quantization width;

means for embedding said digital watermark data in said digital data contents by transforming said frequency coefficient by said amount; and

means for generating watermarked digital data contents.

8. The apparatus as claimed in claim 7, said means for obtaining said complexity of said block data comprising:

means for transforming said block data, by applying a wavelet transform, into coefficients of said wavelet transform, and

means for obtaining said complexity on the basis of the number of high frequency coefficients in said coefficients of said wavelet transform, each of said high frequency coefficients exceeding a threshold.

9. An apparatus for embedding digital watermark data in digital data contents, said apparatus comprising:

means for receiving said digital data contents and said digital watermark data;

means for dividing said digital data contents into block data;

means for obtaining a frequency coefficient of said block data;

means for obtaining an amount of transformation of said frequency coefficient from said digital watermark data by using a quantization width corresponding to said frequency coefficient, said quantization width being obtained beforehand according to a manipulation method of said digital data contents;

means for embedding said digital watermark data in said digital data contents by transforming said frequency coefficient by said amount; and

means for generating watermarked digital data contents.

10. The apparatus as claimed in claim 9, wherein said quantization width is obtained by means comprising:

means for dividing first digital data contents into one or a plurality of first block data;

means for dividing second digital data contents into one or a plurality of second block data, said second digital data contents being obtained by manipulating said first digital data contents with a predetermined manipulation method;

means for transforming said first block data and said second block data into first frequency coefficients and second frequency coefficients respectively by applying an orthogonal transform;

means for obtaining difference values between said first frequency coefficients and said second frequency coefficients for each frequency coefficient;

means for calculating a standard deviation of distribution of said difference values; and

means for obtaining said quantization width by multiplying said standard deviation by a watermark embedding strength.

11. An apparatus for reading digital watermark data embedded in digital data contents, said apparatus comprising:

means for receiving said digital data contents;

means for dividing said digital data contents into block data;

means for obtaining a frequency coefficient of said block data; and

means for generating digital watermark data from said frequency coefficient by using a quantization width corresponding to said frequency coefficient, said quantization width being obtained beforehand according to a manipulation method of said digital data contents.

12. The apparatus as claimed in claim 11, wherein said quantization width is obtained by means comprising:

means for dividing first digital data contents into one or a plurality of first block data;

means for dividing second digital data contents into one or a plurality of second block data, said second digital data contents being

obtained by manipulating said first digital data contents with a predetermined manipulation method;

means for transforming said first block data and said second block data into first frequency coefficients and second frequency coefficients respectively by applying an orthogonal transform;

means for obtaining difference values between said first frequency coefficients and said second frequency coefficients for each frequency coefficient;

means for calculating a standard deviation of distribution of said difference values; and

means for obtaining said quantization width by multiplying said standard deviation by a watermark embedding strength.

13. An integrated circuit for embedding digital watermark data in digital data contents, said integrated circuit comprising:

means for receiving said digital data contents and said digital watermark data;

means for dividing said digital data contents into block data;

means for obtaining a frequency coefficient of said block data;

means for obtaining a complexity of said block data;

means for obtaining an amount of transformation of said frequency coefficient from said complexity and said digital watermark data by using a quantization width;

means for embedding said digital watermark data in said digital data contents by transforming said frequency coefficient by said amount; and

means for generating watermarked digital data contents.

14. The integrated circuit as claimed in claim 13, said means for obtaining said complexity of said block data comprising:

means for transforming said block data, by applying a wavelet transform, into coefficients of said wavelet transform, and

means for obtaining said complexity on the basis of the number of high frequency coefficients in said coefficients of said wavelet transform, each of said high frequency coefficients exceeding a threshold.

15. An integrated circuit for embedding digital watermark data in digital data contents, said integrated circuit comprising:

means for receiving said digital data contents and said digital watermark data;

means for dividing said digital data contents into block data;

means for obtaining a frequency coefficient of said block data;

means for obtaining an amount of transformation of said frequency coefficient from said digital watermark data by using a quantization width corresponding to said frequency coefficient, said quantization width being obtained beforehand according to a manipulation method of said digital data contents;

means for embedding said digital watermark data in said digital data contents by transforming said frequency coefficient by said amount; and

means for generating watermarked digital data contents.

16. The integrated circuit as claimed in claim 15, wherein said quantization width is obtained by means comprising:

means for dividing first digital data contents into one or a plurality of first block data;

means for dividing second digital data contents into one or a plurality of second block data, said second digital data contents being obtained by manipulating said first digital data contents with a predetermined manipulation method;

means for transforming said first block data and said second block data into first frequency coefficients and second frequency coefficients respectively by applying an orthogonal transform;

means for obtaining difference values between said first frequency coefficients and said second frequency coefficients for each frequency coefficient;

means for calculating a standard deviation of distribution of said difference values; and

means for obtaining said quantization width by multiplying said standard deviation by a watermark embedding strength.

17. An integrated circuit for reading digital watermark data embedded in digital data contents, said integrated circuit comprising:

means for receiving said digital data contents;

means for dividing said digital data contents into block data;

means for obtaining a frequency coefficient of said block data; and

means for generating digital watermark data from said frequency coefficient by using a quantization width corresponding to said frequency coefficient, said quantization width being obtained beforehand according to a manipulation method of said digital data contents.

18. The integrated circuit as claimed in claim 17, wherein said quantization width is obtained by means comprising:

means for dividing first digital data contents into one or a plurality of first block data;

means for dividing second digital data contents into one or a plurality of second block data, said second digital data contents being obtained by manipulating said first digital data contents with a predetermined manipulation method;

means for transforming said first block data and said second block data into first frequency coefficients and second frequency coefficients respectively by applying an orthogonal transform;

means for obtaining difference values between said first frequency coefficients and said second frequency coefficients for each frequency

coefficient;

means for calculating a standard deviation of distribution of said difference values; and

means for obtaining said quantization width by multiplying said standard deviation by a watermark embedding strength.

19. A computer readable medium storing program code for causing a computer system to embed digital watermark data in digital data contents, said computer readable medium comprising:

program code means for receiving said digital data contents and said digital watermark data;

program code means for dividing said digital data contents into block data;

program code means for obtaining a frequency coefficient of said block data;

program code means for obtaining a complexity of said block data;

program code means for obtaining an amount of transformation of said frequency coefficient from said complexity and said digital watermark data by using a quantization width;

program code means for embedding said digital watermark data in said digital data contents by transforming said frequency coefficient by said amount; and

program code means for generating watermarked digital data contents.

20. The computer readable medium as claimed in claim 19, said program code means for obtaining said complexity of said block data comprising:

program code means for transforming said block data, by applying a wavelet transform, into coefficients of said wavelet transform, and

program code means for obtaining said complexity on the basis of the number of high frequency coefficients in said coefficients of said wavelet transform, each of said high frequency coefficients exceeding a threshold.

21. A computer readable medium storing program code for causing a computer system to embed digital watermark data in digital data contents, said computer readable medium comprising:

program code means for receiving said digital data contents and said digital watermark data;

program code means for dividing said digital data contents into block data;

program code means for obtaining a frequency coefficient of said block data;

program code means for obtaining an amount of transformation of said frequency coefficient from said digital watermark data by using a quantization width corresponding to said frequency coefficient, said quantization width being obtained beforehand according to a manipulation method of said digital data contents;

program code means for embedding said digital watermark data in said digital data contents by transforming said frequency coefficient by said

amount; and

program code means for generating watermarked digital data contents.

22. The computer readable medium as claimed in claim 21, wherein said quantization width is obtained by program code means comprising:

program code means for dividing first digital data contents into one or a plurality of first block data;

program code means for dividing second digital data contents into one or a plurality of second block data, said second digital data contents being obtained by manipulating said first digital data contents with a predetermined manipulation method;

program code means for transforming said first block data and said second block data into first frequency coefficients and second frequency coefficients respectively by applying an orthogonal transform;

program code means for obtaining difference values between said first frequency coefficients and said second frequency coefficients for each frequency coefficient;

program code means for calculating a standard deviation of distribution of said difference values; and

program code means for obtaining said quantization width by multiplying said standard deviation by a watermark embedding strength.

23. A computer readable medium storing program code for causing a computer system to read digital watermark data embedded in digital data contents, said computer readable medium comprising:

program code means for receiving said digital data contents;

program code means for dividing said digital data contents into block data;

program code means for obtaining a frequency coefficient of said block data; and

program code means for generating digital watermark data from said frequency coefficient by using a quantization width corresponding to said frequency coefficient, said quantization width being obtained beforehand according to a manipulation method of said digital data contents.

24. The computer readable medium as claimed in claim 23, wherein said quantization width is obtained by program code means comprising:

program code means for dividing first digital data contents into one or a plurality of first block data;

program code means for dividing second digital data contents into one or a plurality of second block data, said second digital data contents being obtained by manipulating said first digital data contents with a predetermined manipulation method;

program code means for transforming said first block data and said second block data into first frequency coefficients and second frequency coefficients respectively by applying an orthogonal

transform;

program code means for obtaining difference values between said first frequency coefficients and said second frequency coefficients for each frequency coefficient;

program code means for calculating a standard deviation of distribution of said difference values; and

program code means for obtaining said quantization width by multiplying said standard deviation by a watermark embedding strength.

25. A method for reading digital watermark data embedded in digital data contents, said method comprising the steps of:

receiving said digital data contents;

reading a bit sequence from said digital data contents;

calculating a probability of reading a bit '1' or a bit '0' in said bit sequence by using a test method on the basis of binary distribution;

determining the presence or absence of digital watermark data according to said probability; and

reconstituting and generating said digital watermark data from said bit sequence.

26. The method as claimed in claim 25, further comprising the steps of:

determining threshold α of reliability of digital watermark data which is read;

obtaining a binary distribution function $F(x)$ which represents a probability that a number x of '1' bits or '0' bits are included in a bit sequence which is read at random from digital data contents, said binary distribution function $F(x)$ being obtained by using a probability q of reading '1' or '0' in said bit sequence and a repeating number of embedding each bit of digital watermark data;

reading an ith digital watermark sequence of said digital watermark data from a digital watermark area of said digital data contents;

calculating the number k_i of '1' or '0' included in said digital watermark sequence;

calculating a probability $F(k_i)$ by using said binary distribution function $F(x)$; and

reconstituting '1' or '0' from ith digital watermark data w_i if $F(k_i) > \alpha$, reconstituting '0' or '1' from ith digital watermark data w_i if $1-F(k_i) > \alpha$, and determining that there is no watermark data or the presence is unknown if both of $F(k_i) > \alpha$ and $1-F(k_i) > \alpha$ are not satisfied.

27. The method as claimed in claim 26, further comprising the steps of:

outputting $F(k_i)$ as reliability if said reconstituted digital watermark data w_i is '1'; and

outputting $1-F(k_i)$ as the reliability if said reconstituted digital watermark data w_i is '0'.

28. The method as claimed in claim 25,

further comprising the steps of:

determining a threshold α of reliability of digital watermark data which is read;

obtaining a binary distribution function F(x) which represents a probability that a number x of '1' bits or '0' bits are included in a bit sequence which is read at random from digital data contents, said binary distribution function F(x) being obtained by using a probability q of reading '1' or '0' in said bit sequence and a repeating number of embedding each bit of digital watermark data;

reading an ith digital watermark sequence of said digital watermark data from a digital watermark area of said digital data contents;

checking whether a probability that said digital watermark sequence is digital watermark data exceeds said threshold α by using said binary distribution function F(x); and

reconstituting digital watermark data from said digital watermark sequence by using majority decision processing if said probability exceeds α, and determining that there is no watermark data or the presence is unknown if said probability does not exceed α.

29. The method as claimed in claim 28, further comprising a step of outputting said probability that said digital watermark sequence is digital watermark data.

30. The method as claimed in claim 25, if a data sequence which is embedded as said digital watermark data is modulated by a pseudo-random sequence, said method further comprising the steps of:

demodulating said bit sequence by said pseudo-random sequence; and

reconstituting digital watermark data from said demodulated bit sequence.

31. The method as claimed in claim 25, if a data sequence which is embedded as said digital watermark data is modulated by a pseudo-random sequence, said method further comprising the steps of:

determining a threshold α of reliability of digital watermark data which is read;

obtaining a binary distribution function F(x) which represents a probability that a number of x of '1' bits or '0' bits are included in a bit sequence which is read at random from digital data contents, said binary distribution function F(x) being obtained by using a probability q of reading '1' or '0' in said bit sequence and a repeating number of embedding each bit of digital watermark data;

reading an ith digital watermark sequence of said digital watermark data from a digital watermark area of said digital data contents;

demodulating said digital watermark sequence by said pseudo-random sequence;

assigning 1/2 to said probability q;

obtaining a maximum number x_0 which satisfies $0 \leqq F(x=x_0) \leqq 1-\alpha$ and a minimum number x_1

which satisfies $\alpha \leqq F(x=x_1) \leqq 1$;

obtaining the number k_i of '1' or '0' included in said ith digital watermark sequence; and

reconstituting ith digital watermark data w_i as '0' or '1' if $k_i \leqq x_0$, and reconstituting said ith digital watermark data w_i as '1' or '0' if $k_i \geqq x_1$.

32. The method as claimed in claim 25, if a data sequence which is embedded as said digital watermark data is modulated by a pseudo-random sequence, said method further comprising the steps of:

determining a threshold α of reliability of digital watermark data which is read;

obtaining a binary distribution function $F(x)$ which represents a probability that x of '1' bits or '0' bits are included in a bit sequence which is read at random from digital data contents, said binary distribution function $F(x)$ being obtained by using a probability q of reading '1' or '0' in said bit sequence and a repeating number t of embedding each bit of digital watermark data;

reading an ith digital watermark sequence of said digital watermark data from a digital watermark area of said digital data contents;

demodulating said digital watermark sequence by said pseudo-random sequence;

assigning 1/2 to said probability q;

obtaining x_0 or x_1 which satisfies $0 \leqq F(x=x_0) \leqq 1-\alpha$ or $\alpha \leqq F(x=x_1) \leqq 1$;

determining whether a value is equal to or less than x_0 or equal to or more than x_1, said value being a mean value of absolute values of a difference between the number of '0' or '1' included

in said ith digital watermark sequence and a central value $q \times t$ of a binary distribution;

reconstituting digital watermark data by performing majority decision processing for said ith digital watermark sequence if said value is equal to or less than x_0 or equal to or more than x_1; and

determining that there is no digital watermark data or the presence is unknown if said value is not equal to or less than x_0 or equal to or more than x_1.

33. The method as claimed in claim 32, further comprising the steps of:

calculating a value of said binary distribution function F(z), z being said mean value obtained from the number of '0' or '1' included in said ith digital watermark sequence and said central value $q \times t$; and

outputting said value of F(z) as reliability of digital watermark data.

34. An apparatus for reading digital watermark data embedded in digital data contents, said apparatus comprising:

means for receiving said digital data contents;

means for reading a bit sequence from said digital data contents;

means for calculating a probability of reading a bit '1' or a bit '0' in said bit sequence by using a test method on the basis of binary

distribution;

means for determining the presence or absence of digital watermark data according to said probability; and

means for reconstituting said digital watermark data from said bit sequence.

35. The apparatus as claimed in claim 34, further comprising:

means for obtaining a binary distribution function $F(x)$ which represents a probability that a number x of '1' bits or '0' bits are included in a bit sequence which is read at random from digital data contents, said binary distribution function $F(x)$ being obtained by using a probability q of reading '1' or '0' in said bit sequence and a repeating number of embedding each bit of digital watermark data;

means for reading an ith digital watermark sequence of said digital watermark data from a digital watermark area of said digital data contents;

means for calculating the number k_i of '1' or '0' included in said digital watermark sequence;

means for calculating a probability $F(k_i)$ by using said binary distribution function $F(x)$; and

means for reconstituting '1' or '0' from ith digital watermark data w_i if $F(k_i) > \alpha$, reconstituting '0' or '1' from ith digital watermark data w_i if $1-F(k_i) > \alpha$, and, determining that there is no watermark data or the presence is unknown if both of $F(k_i) > \alpha$ and $1-F(k_i) > \alpha$ are not satisfied, α being a threshold of reliability of digital watermark data which is read.

36. The apparatus as claimed in claim 35, further comprising:

means for outputting $F(k_i)$ as reliability if said reconstituted digital watermark data w_i is '1'; and

means for outputting $1-F(k_i)$ as reliability if said reconstituted digital watermark data w_i is '0'.

37. The apparatus as claimed in claim 34, further comprising:

means for obtaining a binary distribution function F(x) which represents a probability that a number x of '1' bits or '0' bits are included in a bit sequence which is read at random from digital data contents, said binary distribution function F(x) being obtained by using a probability q of reading '1' or '0' in said bit sequence and a repeating number of embedding each bit of digital watermark data;

means for reading an ith digital watermark sequence of said digital watermark data from a digital watermark area of said digital data contents;

means for checking whether a probability that said digital watermark sequence is digital watermark data exceeds said threshold α by using said binary distribution function F(x), α being a threshold of reliability of digital watermark data which is read; and

means for reconstituting and generating digital watermark data from said digital watermark sequence by using majority decision processing if said probability exceeds α, and, determining that there is no watermark data or the presence is unknown if said probability does not exceed α.

38. The apparatus as claimed in claim 37, further comprising means for outputting said probability that said digital watermark sequence is digital watermark data.

39. The apparatus as claimed in claim 34, if a data sequence which is embedded as said digital watermark data is modulated by a pseudo-random sequence, said apparatus further comprising:

means for demodulating said bit sequence by said pseudo-random sequence; and

means for reconstituting digital watermark data from said demodulated bit sequence.

40. The apparatus as claimed in claim 34, if a data sequence which is embedded as said digital watermark data is modulated by a pseudo-random sequence, said apparatus further comprising:

means for obtaining a binary distribution function F(x) which represents a probability that a number x of '1' bits or '0' bits are included in a

bit sequence which is read at random from digital data contents, said binary distribution function F(x) being obtained by using a probability q of reading '1' or '0' in said bit sequence and a repeating number of embedding each bit of digital watermark data;

means for reading an ith digital watermark sequence of said digital watermark data from a digital watermark area of said digital data contents;

means for demodulating said digital watermark sequence by said pseudo-random sequence;

means for assigning 1/2 to said probability q;

means for obtaining a maximum number x_0 which satisfies $0 \leqq F(x=x_0) \leqq 1-\alpha$ and a minimum number x_1 which satisfies $\alpha \leqq F(x=x_1) \leqq 1$, α being a threshold of reliability of digital watermark data which is read;

means for obtaining the number k_i of '1' or '0' included in said ith digital watermark sequence; and

means for reconstituting ith digital watermark data w_i as '0' or '1' if $k_i \leqq x_0$, and, reconstituting said ith digital watermark data w_i as '1' or '0' if $k_i \geqq x_1$.

41. The apparatus as claimed in claim 34, if a data sequence which is embedded as said digital watermark data is modulated by a pseudo-random sequence, said apparatus further comprising:

means for obtaining a binary distribution function F(x) which represents a probability that a number x of '1' bits or '0' bits are included in a

bit sequence which is read at random from digital data contents, said binary distribution function F(x) being obtained by using a probability q of reading '1' or '0' in said bit sequence and a repeating number t of embedding each bit of digital watermark data;

means for reading an ith digital watermark sequence of said digital watermark data from a digital watermark area of said digital data contents;

means for demodulating said digital watermark sequence by said pseudo-random sequence;

means for assigning 1/2 to said probability q;

means for obtaining x_0 or x_1 which satisfies $0 \leqq F(x=x_0) \leqq 1-\alpha$ or $\alpha \leqq F(x=x_1) \leqq 1$, α being a threshold of reliability of digital watermark data which is read;

means for determining whether a value is equal to or less than x_0 or equal to or more than x_1, said value being a mean value of absolute values of a difference between the number of '0' or '1' included in said ith digital watermark sequence and a central value $q \times t$ of a binary distribution;

means for reconstituting digital watermark data by performing majority decision processing for said ith digital watermark sequence if said value is equal to or less than x_0 or equal to or more than x_1; and

means for determining that there is no digital watermark data or the presence is unknown if said value is not equal to or less than x_0 or equal to or more than x_1.

42. The apparatus as claimed in claim 41, further comprising:

means for calculating a value of said binary distribution function F(z), z being said mean value obtained from the number of '0' or '1' included in said ith digital watermark sequence and said central value $q \times t$; and

means for outputting said value of F(z) as reliability of digital watermark data.

43. An integrated circuit for reading digital watermark data embedded in digital data contents, said integrated circuit comprising:

means for receiving said digital data contents;

means for reading a bit sequence from said digital data contents;

means for calculating a probability of reading a bit '1' or a bit '0' in said bit sequence by using a test method on the basis of binary distribution;

means for determining the presence or absence of digital watermark data according to said probability; and

means for reconstituting and generating said digital watermark data from said bit sequence.

44. The integrated circuit as claimed in claim 43, further comprising:

means for obtaining a binary distribution function F(x) which represents a probability that a

number x of '1' bits or '0' bits are included in a bit sequence which is read at random from digital data contents, said binary distribution function F(x) being obtained by using a probability q of reading '1' or '0' in said bit sequence and a repeating number of embedding each bit of digital watermark data;

means for reading an ith digital watermark sequence of said digital watermark data from a digital watermark area of said digital data contents;

means for calculating the number k_i of '1' or '0' included in said digital watermark sequence;

means for calculating a probability $F(k_i)$ by using said binary distribution function F(x); and

means for reconstituting '1' or '0' from ith digital watermark data w_i if $F(k_i) > \alpha$, reconstituting '0' or '1' from ith digital watermark data w_i if $1-F(k_i) > \alpha$, and determining that there is no watermark data or the presence is unknown if both of $F(k_i) > \alpha$ and $1-F(k_i) > \alpha$ are not satisfied, α being a threshold of reliability of digital watermark data which is read.

45. The integrated circuit as claimed in claim 44, further comprising:

means for outputting $F(k_i)$ as reliability if said reconstituted digital watermark data w_i is '1'; and

means for outputting $1-F(k_i)$ as reliability if said reconstituted digital watermark data w_i is '0'.

46. The integrated circuit as claimed in claim 43, further comprising:

means for obtaining a binary distribution function F(x) which represents a probability that a number of x of '1' bits or '0' bits are included in a bit sequence which is read at random from digital data contents, said binary distribution function F(x) being obtained by using a probability q of reading '1' or '0' in said bit sequence and a repeating number of embedding each bit of digital watermark data;

means for reading an ith digital watermark sequence of said digital watermark data from a digital watermark area of said digital data contents;

means for checking whether a probability that said digital watermark sequence is digital watermark data exceeds said threshold α by using said binary distribution function F(x), α being a threshold of reliability of digital watermark data which is read; and

means for reconstituting and generating digital watermark data from said digital watermark sequence by using majority decision processing if said probability exceeds α, and, determining that there is no watermark data or the presence is unknown if said probability does not exceed α.

47. The integrated circuit as claimed in claim 46, further comprising means for outputting said probability that said digital watermark sequence is digital watermark data.

48. The integrated circuit as claimed in claim 43, if a data sequence which is embedded as said digital watermark data is modulated by a pseudo-random sequence, said integrated circuit further comprising:

means for demodulating said bit sequence by said pseudo-random sequence; and

means for reconstituting digital watermark data from said demodulated bit sequence.

49. The integrated circuit as claimed in claim 43, if a data sequence which is embedded as said digital watermark data is modulated by a pseudo-random sequence, said integrated circuit further comprising:

means for obtaining a binary distribution function F(x) which represents a probability that a number x of '1' bits or '0' bits are included in a bit sequence which is read at random from digital data contents, said binary distribution function F(x) being obtained by using a probability q of reading '1' or '0' in said bit sequence and a repeating number of embedding each bit of digital watermark data;

means for reading an ith digital watermark sequence of said digital watermark data from a digital watermark area of said digital data contents;

means for demodulating said digital watermark sequence by said pseudo-random sequence;

means for assigning 1/2 to said probability q;

means for obtaining a maximum number x_0 which satisfies $0 \leqq F(x=x_0) \leqq 1-\alpha$ and a minimum number x_1 which satisfies $\alpha \leqq F(x=x_1) \leqq 1$, α being a threshold of reliability of digital watermark data which is read; and

means for obtaining the number k_i of '1' or '0' included in said ith digital watermark sequence;

means for reconstituting ith digital watermark data w_i as '0' or '1' if $k_i \leqq x_0$, and, reconstituting said ith digital watermark data w_i as '1' or '0' if $k_i \geqq x_1$.

50. The integrated circuit as claimed in claim 43, if a data sequence which is embedded as said digital watermark data is modulated by a pseudo-random sequence, said integrated circuit further comprising:

means for obtaining a binary distribution function F(x) which represents a probability that a number x of '1' bits or '0' bits are included in a bit sequence which is read at random from digital data contents, said binary distribution function F(x) being obtained by using a probability q of reading '1' or '0' in said bit sequence and a repeating number t of embedding each bit of digital watermark data;

means for reading an ith digital watermark sequence of said digital watermark data from a digital watermark area of said digital data contents;

means for demodulating said digital

watermark sequence by said pseudo-random sequence;

means for assigning 1/2 to said probability q;

means for obtaining x_0 or x_1 which satisfies $0 \leqq F(x=x_0) \leqq 1-\alpha$ or $\alpha \leqq F(x=x_1) \leqq 1$, α being a threshold of reliability of digital watermark data which is read;

means for determining whether a value is equal to or less than x_0 or equal to or more than x_1, said value being a mean value of absolute values of a difference between the number of '0' or '1' included in said ith digital watermark sequence and a central value $q \times t$ of a binary distribution;

means for reconstituting digital watermark data by performing majority decision processing for said ith digital watermark sequence if said value is equal to or less than x_0 or equal to or more than x_1; and

means for determining that there is no digital watermark data or the presence is unknown if said value is not equal to or less than x_0 or equal to or more than x_1.

51. The integrated circuit as claimed in claim 50, further comprising:

means for calculating a value of said binary distribution function F(z), z being said mean value obtained from the number of '0' or '1' included in said ith digital watermark sequence and said central value $q \times t$; and

means for outputting said value of F(z) as reliability of digital watermark data.

52. A computer readable medium storing program code for causing a computer system to read digital watermark data embedded in digital data contents, said computer readable medium comprising:

program code means for receiving said digital data contents;

program code means for reading a bit sequence from said digital data contents;

program code means for calculating a probability of reading a bit '1' or a bit '0' in said bit sequence by using a test method on the basis of binary distribution;

program code means for determining the presence or absence of digital watermark data according to said probability; and

program code means for reconstituting and generating said digital watermark data from said bit sequence.

53. The computer readable medium as claimed in claim 52, further comprising:

program code means for obtaining a binary distribution function F(x) which represents a probability that a number x of '1' bits or '0' bits are included in a bit sequence which is read at random from digital data contents, said binary distribution function F(x) being obtained by using a probability q of reading '1' or '0' in said bit sequence and a repeating number of embedding each bit of digital watermark data;

program code means for reading an ith digital watermark sequence of said digital watermark

data from a digital watermark area of said digital data contents;

program code means for calculating the number k_i of '1' or '0' included in said digital watermark sequence; and

program code means for calculating a probability $F(k_i)$ by using said binary distribution function $F(x)$;

program code means for reconstituting '1' or '0' from ith digital watermark data w_i if $F(k_i) > \alpha$, reconstituting '0' or '1' from ith digital watermark data w_i if $1-F(k_i) > \alpha$, and, determining that there is no watermark data or the presence is unknown if both of $F(k_i) > \alpha$ and $1-F(k_i) > \alpha$ are not satisfied, α being a threshold of reliability of digital watermark data which is read.

54. The computer readable medium as claimed in claim 53, further comprising:

program code means for outputting $F(k_i)$ as reliability if said reconstituted digital watermark data w_i is '1'; and

program code means for outputting $1-F(k_i)$ as reliability if said reconstituted digital watermark data w_i is '0'.

55. The computer readable medium as claimed in claim 52, further comprising:

program code means for obtaining a binary distribution function $F(x)$ which represents a probability that a number x of '1' bits or '0' bits

are included in a bit sequence which is read at random from digital data contents, said binary distribution function F(x) being obtained by using a probability q of reading '1' or '0' in said bit sequence and a repeating number of embedding each bit of digital watermark data;

program code means for reading an ith digital watermark sequence of said digital watermark data from a digital watermark area of said digital data contents;

program code means for checking whether a probability that said digital watermark sequence is digital watermark data exceeds said threshold α by using said binary distribution function F(x), α being a threshold of reliability of digital watermark data which is read; and

program code means for reconstituting and generating digital watermark data from said digital watermark sequence by using majority decision processing if said probability exceeds α, and determining that there is no watermark data or the presence is unknown if said probability does not exceed α.

56. The computer readable medium as claimed in claim 55, further comprising program code means for outputting said probability that said digital watermark sequence is digital watermark data as reliability of said reconstituted digital watermark data.

57. The computer readable medium as claimed in claim 52, if a data sequence which is embedded as said digital watermark data is modulated by a pseudo-random sequence, said computer readable medium further comprising:

program code means for demodulating said bit sequence by said pseudo-random sequence; and

program code means for reconstituting digital watermark data from said demodulated bit sequence.

58. The computer readable medium as claimed in claim 52, if data sequence which is embedded as said digital watermark data is modulated by a pseudo-random sequence, said computer readable medium further comprising:

program code means for obtaining a binary distribution function F(x) which represents a probability that a number x of '1' bits or '0' bits are included in a bit sequence which is read at random from digital data contents, said binary distribution function F(x) being obtained by using a probability q of reading '1' or '0' in said bit sequence and a repeating number of embedding each bit of digital watermark data;

program code means for reading an ith digital watermark sequence of said digital watermark data from a digital watermark area of said digital data contents;

program code means for demodulating said digital watermark sequence by said pseudo-random sequence;

program code means for assigning 1/2 to said probability q;

program code means for obtaining a maximum number x_0 which satisfies $0 \leqq F(x=x_0) \leqq 1-\alpha$ and a minimum number x_1 which satisfies $\alpha \leqq F(x=x_1) \leqq 1$, α being a threshold of reliability of digital watermark data which is read;

program code means for obtaining the number k_i of '1' or '0' included in said ith digital watermark sequence; and

program code means for reconstituting ith digital watermark data w_i as '0' or '1' if $k_i \leqq x_0$, and reconstituting said ith digital watermark data w_i as '1' or '0' if $k_i \geqq x_1$.

59. The computer readable medium as claimed in claim 52, if a data sequence which is embedded as said digital watermark data is modulated by a pseudo-random sequence, said computer readable medium further comprising:

program code means for obtaining a binary distribution function F(x) which represents a probability that a number x of '1' bits or '0' bits are included in a bit sequence which is read at random from digital data contents, said binary distribution function F(x) being obtained by using a probability q of reading '1' or '0' in said bit sequence and a repeating number t of embedding each bit of digital watermark data;

program code means for reading an ith digital watermark sequence of said digital watermark data from a digital watermark area of said digital data contents;

program code means for demodulating said digital watermark sequence by said pseudo-random sequence;

program code means for assigning 1/2 to said probability q;

program code means for obtaining x_0 or x_1 which satisfies $0 \leqq F(x=x_0) \leqq 1-\alpha$ or $\alpha \leqq F(x=x_1) \leqq 1$, α being a threshold of reliability of digital watermark data which is read;

program code means for determining whether a value is equal to or less than x_0 or equal to or more than x_1, said value being a mean value of absolute values of a difference between the number of '0' or '1' included in said ith digital watermark sequence and a central value $q \times t$ of a binary distribution;

program code means for reconstituting digital watermark data by performing majority decision processing for said ith digital watermark sequence if said value is equal to or less than x_0 or equal to or more than x_1; and

program code means for determining that there is no digital watermark data or the presence is unknown if said value is not equal to or less than x_0 or equal to or more than x_1.

60. The computer readable medium as claimed in claim 59, further comprising:

program code means for calculating a value of said binary distribution function F(z), z being said mean value obtained from the number of '0' or '1' included in said ith digital watermark sequence and said central value $q \times t$; and

program code means for outputting said value of F(z) as reliability of digital watermark data.

61. A method for reading digital watermark data from digital data contents in which each bit of digital watermark data is embedded a plurality of times, said method comprising the steps of:

receiving digital data contents;

reading a digital watermark sequence from said digital data contents;

performing soft decision in code theory by assigning weights to said digital watermark sequence with a weighting function; and

reconstituting and generating digital watermark data from said digital watermark sequence.

62. The method as claimed in claim 61, wherein said weighting function is a distribution function obtained by a method comprising the steps of:

dividing first digital data contents into one or a plurality of first block data;

dividing second digital data contents into one or a plurality of second block data, said second digital data contents being obtained by manipulating said first digital data contents with a predetermined manipulation method;

transforming said first block data and said second block data into first frequency coefficients and second frequency coefficients respectively by applying an orthogonal transform; and

obtaining a distribution of difference values between said first frequency coefficients and

said second frequency coefficients, said distribution function being an approximation of said distribution,

wherein said weights are assigned to said digital watermark sequence according to values of said distribution function.

63. The method as claimed in claim 61, wherein said weighting function is a distribution function obtained by a method comprising the steps of:

dividing first digital data contents into one or a plurality of first block data;

dividing second digital data contents into one or a plurality of second block data, said second digital data contents being obtained by manipulating said first digital data contents with a predetermined manipulation method;

transforming said first block data and said second block data into first frequency coefficients and second frequency coefficients respectively by applying an orthogonal transform; and

obtaining said distribution function on the basis of a theory if a distribution of difference values between said first frequency coefficients and said second frequency coefficients can be obtained by said theory,

wherein said weights are assigned to said digital watermark sequence according to values of said distribution function.

64. An apparatus for reading digital watermark data from digital data contents in which each bit of digital watermark data is embedded a plurality of times, said apparatus comprising:

means for receiving digital data contents;

means for reading a digital watermark sequence from said digital data contents;

means for performing soft decision in code theory by assigning weights to said digital watermark sequence with a weighting function; and

means for reconstituting and generating digital watermark data from said digital watermark sequence.

65. The apparatus as claimed in claim 64, wherein said weighting function is a distribution function obtained by means comprising:

means for dividing first digital data contents into one or a plurality of first block data;

means for dividing second digital data contents into one or a plurality of second block data, said second digital data contents being obtained by manipulating said first digital data contents with a predetermined manipulation method;

means for transforming said first block data and said second block data into first frequency coefficients and second frequency coefficients respectively by applying an orthogonal transform; and

means for obtaining a distribution of difference values between said first frequency coefficients and said second frequency coefficients,

said distribution function being an approximation of said distribution,

wherein said weights are assigned to said digital watermark sequence according to values of said distribution function.

66. The apparatus as claimed in claim 64, wherein said weighting function is a distribution function obtained by means comprising:

means for dividing first digital data contents into one or a plurality of first block data;

means for dividing second digital data contents into one or a plurality of second block data, said second digital data contents being obtained by manipulating said first digital data contents with a predetermined manipulation method;

means for transforming said first block data and said second block data into first frequency coefficients and second frequency coefficients respectively by applying an orthogonal transform ;

means for obtaining said distribution function on the basis of a theory if a distribution of difference values between said first frequency coefficients and said second frequency coefficients can be obtained by said theory, and

wherein said weights are assigned to said digital watermark sequence according to values of said distribution function.

67. An integrated circuit for reading

digital watermark data from digital data contents in which each bit of digital watermark data is embedded a plurality of times, said integrated circuit comprising:

means for receiving digital data contents;

means for reading a digital watermark sequence from said digital data contents;

means for performing soft decision in code theory by assigning weights to said digital watermark sequence with a weighting function; and

means for reconstituting and generating digital watermark data from said digital watermark sequence.

68. The integrated circuit as claimed in claim 67, wherein said weighting function is a distribution function obtained by means comprising :

means for dividing first digital data contents into one or a plurality of first block data;

means for dividing second digital data contents into one or a plurality of second block data, said second digital data contents being obtained by manipulating said first digital data contents with a predetermined manipulation method;

means for transforming said first block data and said second block data into first frequency coefficients and second frequency coefficients respectively by applying an orthogonal transform; and

means for obtaining a distribution of difference values between said first frequency coefficients and said second frequency coefficients, said distribution function being an approximation of

said distribution,

wherein said weights are assigned to said digital watermark sequence according to values of said distribution function.

69. The integrated circuit as claimed in claim 67, wherein said weighting function is a distribution function obtained by means comprising:

means for dividing first digital data contents into one or a plurality of first block data;

means for dividing second digital data contents into one or a plurality of second block data, said second digital data contents being obtained by manipulating said first digital data contents with a predetermined manipulation method;

means for transforming said first block data and said second block data into first frequency coefficients and second frequency coefficients respectively by applying an orthogonal transform; and

means for obtaining said distribution function on the basis of a theory if a distribution of difference values between said first frequency coefficients and said second frequency coefficients can be obtained by said theory,

wherein said weights are assigned to said digital watermark sequence according to values of said distribution function.

70. A computer readable medium storing

program code for causing a computer system to read digital watermark data from digital data contents in which each bit of digital watermark data is embedded a plurality of times, said computer readable medium comprising:

program code means for receiving digital data contents;

program code means for reading a digital watermark sequence from said digital data contents;

program code means for performing soft decision in code theory by assigning weights to said digital watermark sequence with a weighting function; and

program code means for reconstituting and generating digital watermark data from said digital watermark sequence.

71. The computer readable medium as claimed in claim 70, wherein said weighting function is a distribution function obtained by program code means comprising:

program code means for dividing first digital data contents into one or a plurality of first block data;

program code means for dividing second digital data contents into one or a plurality of second block data, said second digital data contents being obtained by manipulating said first digital data contents with a predetermined manipulation method;

program code means for transforming said first block data and said second block data into first frequency coefficients and second frequency coefficients respectively by applying an orthogonal

transform; and

program code means for obtaining a distribution of difference values between said first frequency coefficients and said second frequency coefficients, said distribution function being an approximation of said distribution,

wherein said weights are assigned to said digital watermark sequence according to values of said distribution function.

72. The computer readable medium as claimed in claim 70, wherein said weighting function is a distribution function obtained by program code means comprising:

program code means for dividing first digital data contents into one or a plurality of first block data;

program code means for dividing second digital data contents into one or a plurality of second block data, said second digital data contents being obtained by manipulating said first digital data contents with a predetermined manipulation method;

program code means for transforming said first block data and said second block data into first frequency coefficients and second frequency coefficients respectively by applying an orthogonal transform; and

program code means for obtaining said distribution function on the basis of a theory if a distribution of difference values between said first frequency coefficients and said second frequency coefficients can be obtained by said theory,

wherein said weights are assigned to said

digital watermark sequence according to values of said distribution function.